

FLORAE MALESIANAE PRAECURSORES LIII. APOCYNACEAE II.

6. URNULARIA, 7. WILLUGHBEIA, 8. KOPSIA

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6. URNULARIA

Stapf, Hook. Ic. (1901) t. 2711; Merr., En. Born. (1921) 497; Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948) 154; Bakh. f., Blumea 6 (1950) 385; Back. & Bakh. f., Fl. Java 2 (1965) 224.

Glabrous lianas with branched axillary tendrils. *Leaves* decussate, coriaceous or subcoriaceous, ovate, elliptic, or lanceolate. *Inflorescences* axillary, thyrsoïd, slightly longer than the petioles of the subtending leaves, loose, with rather long slender branches. *Flowers* small, pentamerous. *Pedicels* with 1 or 2 bracteoles. *Calyx* lobes orbicular to ovate, ciliate, without glands inside. *Corolla* urceolate, yellowish, tube inflated, globular, constricted at the mouth but without mouth scales; lobes ovate or ovate-oblong, obtuse, auriculate, as long as the tube, overlapping to the left, forming a cylindric bud much narrower than the tube. *Stamens* inserted in the middle of the tube, anthers short-ovate. *Ovary* superior, glabrous, conical, syncarpous, bicarpellate, unilocular, multiovulate. *Style* short. *Stigma* head widened from the style into a narrow dish and crowned by two short tips reaching up to the anthers. *Fruit* a globose yellow berry. *Seeds* ellipsoidal, exalbuminous; embryo with large and thick cotyledons and a short radicle.

Distribution. 7 species, endemic in western Malesia, from the Malay Peninsula to Borneo.

Note. This genus is closely related to *Willughbeia* which differs by a cylindric corolla tube, by congested inflorescences not longer than the subtending petiole (except in *W. anomala*), corresponding by fruits with a shorter stalk.

The tendrils are modified inflorescences as in *Willughbeia*, *Clitandra* (Africa), and *Landolphia* (Africa and South America).

This genus was established by Stapf on 5 species. Two of these, *U. beccariana* (Pierre) Stapf and *U. beccarii* (Pierre) Markgr. (= *U. oblongifolia* Stapf), were formerly described under *Ancylodadus*. Pierre even made the latter species the type of a new section, *Cyclopholis*, of *Ancylodadus*, which was acknowledged by Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948) 155, as a section of *Urnularia*. This section was based by Pierre on leaf nervation, petiole anatomy, and especially on the presence of mouth scales in the corolla.

Rendering account to myself of this third character, I could not confirm it in the type specimen in the herbarium of the late M. Pierre kindly lent me by the Muséum National d'Histoire Naturelle. It is a duplum of *Beccari Pianta Bornensi* n. 2272, on which Pierre has carried out his investigations. It presents only very young flowers which, moreover, have become very hard by drying. It must be appreciated how well Pierre at his time (1898) has analysed this refractory material. I had the opportunity to observe again the flower on the envelop of which Pierre had written 'corolle ouverte avec squames ou callosités 2—3 devant chaque pétale'. Moreover, I succeeded in soaking by means of tinovetine some

better developed flowers of the same number kindly lent me by the herbarium of Florence and in analyzing these too. Just like Stapf, in none of all flowers investigated I could perceive such mouth scales. But as the globose-inflated corolla tube becomes strongly constricted at the mouth, the mass of tissue gets thicker there. Immediately at this level are inserted the 5 auriculate corolla lobes. By spreading them out, even with precaution, one can not avoid to tug at the mouth. Thus the impression may rise that a minute knob is neighbored to each gap between the lobes, i.e. seemingly two before each lobe. This may be observed in all species of *Urularia*. But as already Pierre pointed out, they are not free. One cannot go behind these 'scales' with a needle, as is possible in the case of the real mouth scales of other *Apocynaceae*.

Pierre's scrutiny being known, I felt obliged to look for the origin of the uncertainty. For this purpose it proved useful that in his herbarium his sketches and exact notes are added to the sheets. From these it appeared that at first Pierre had taken the specimen as a *Melodinus* and was surprised to miss the mouth scales characteristic for this genus: 'il n'y a pas à la gorge de la corolle les appendices particuliers du *Melodinus*' and 'cette plante indique un *Melodinus*, mais en diffère par le méristèle ouverte et absence de squames'. This note is dated 'M.P. 6/98'. Under the date 'PIERRE M.P. 7/98', 'squami gemini' are mentioned and are added for defining a new genus *Dinopholis*, changed into *Cyclopholis*. There has been added in a very minute handwriting: 'corollae tubus callosus vel geminatis squamosus'. An addition to the description cited first (of June, 1898) in the same minute handwriting remarks: 'le sommet du tube est pourvu devant chaque lobe de 2 à 4 appendices sessiles, à peine libre en haut, se présentant plutôt comme des callosités que comme des appendices'. Apparently, he was not sure about them. In an undated sketch, however, they are accentuated rather well. They appear still more distinct in a lithographed drawing by M. Delpuy of 1902 which is found in several herbaria. This drawing contains other doubtful details too: the globose shape of the corolla tube, not mentioned by Pierre, is not recognizable and the inflorescences are wrongly condensed and given a stiff and thick rachis reminding of a *Melodinus*. Pichon, in a very small drawing in *Mém. Mus. Hist. Nat. Paris* II, 24 (1948) t. 3 f. 28, shows single minute teeth. Apparently, he also has not seen true mouth scales.

Mouth scales are in reality not present, as stated above, and hence the section *Cyclopholis* based on them cannot be maintained.

KEY TO THE SPECIES

1. Leaves broad-ovate with rounded base, strongly coriaceous, glaucous below, length/width ratio $c. 1\frac{1}{2}$ ($7-8 \times 4\frac{1}{2}-5$ cm), venation indistinct 1. *U. ovatifolia*
1. Leaves less broad, length/width ratio 2—3, not glaucous below.
 2. Leaves with rounded base, not shining. Inflorescence with $c. 20-30$ flowers.
 3. Leaves coriaceous, elliptic, short-acuminate. Inflorescences 4—5 cm long, most of their branches with 2 internodes.
 4. Nerves bent forward, without intercalated veins; venation more discernable, consisting of fine veins transverse to the midrib and oblique to the nerves. Inflorescences loose, their branches thyrsoid with lower internodes of 7—8 mm. 2. *U. beccariana*
 4. Nerves spreading, almost transverse to the midrib, with one distinct intercalated vein parallel between almost every pair. Inflorescences dense, their branches cymose with lower internodes of 2—3 mm. 3. *U. flavescens*
 3. Leaves subcoriaceous, oblong, long-acuminate; nerves transverse to the midrib, with more than one parallel intercalated vein between two nerves, without reticulation. Inflorescences loose, their branches with only one internode 4. *U. beccarii*
 2. Leaves with acute to cuneate base, shining above, Inflorescences with $c. 12$ flowers.
 5. Leaves lanceolate, $5-8.5 \times 1.8-3.5$ cm, without intercalated veins, veins oblique to the nerves 5. *U. lanceolata*

5. Leaves lance-elliptic, with intercalated veins parallel to the nerves.

6. Leaves coriaceous, short-acuminate, 7—10 × 3—4.5 cm; veins oblique to the nerves

6. *U. rufescens*

6. Leaves subchartaceous, long-acuminate, 5—9 × 2—4 cm; veins and intercalated veins parallel to the nerves 7. *U. javanica*

1. *Urnularia ovatifolia* Stapf, Hook. Ic. (1901) t. 2711 p. 3. — *Willughbeia ovatifolia* Merr., J. As. Soc. Mal. 1 (1923) 29.

BORNEO. Sarawak. Haviland 2302, Kuching.

2. *Urnularia beccariana* (Pierre) Stapf, l.c. f. 1—6, p. 1—2. — *Ancylocladus beccarianus* O. Ktze [Rev. Gen. 1 (1891) 412, *nomen*] ex Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 98. — *Willughbeia beccariana* K. Schum. in E. & P., Nat. Pfl. Fam. Nachtr. 2 (1900) 55.

BORNEO. Sarawak. Beccari 3764, banks of Bintulu R. — Brunei. Sinclair 10518, Sg. Belait. — East. Kostermans 21354, Berau, Mt. Njapa. — Sabah. Singh NBF 48431, Sandakan, mile 45 Labuk Rd.; Singh & Nordin NBF 48484(a), Tawau Dist., mile 13 Apas Rd.

3. *Urnularia flavescens* (Hook. f.) Stapf, l.c. f. 7, p. 2. — *Willughbeia flavescens* Dyer ex Hook. f., Fl. Brit. Ind. 3 (1882) 625. — *Ancylocladus flavescens* O. Ktze, Rev. Gen. 1 (1891) 412. — *Melodinus cymosus* Ridl., J. Fed. Mal. St. Mus. 10 (1920) 146.

Distribution. Malay Peninsula (Wellesley, Perak, Malacca, Singapore).

4. *Urnularia beccarii* (Pierre) Markgr., *nov. comb.* — *Ancylocladus beccarii* Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 98. — *Willughbeia beccarii* K. Schum. in E. & P., Nat. Pfl. Fam. Nachtr. 2 (1900) 55. — *U. oblongifolia* Stapf, Hook. Ic. (1901) t. 2711 p. 2. — *Willughbeia stapfii* Merr., J. As. Soc. Mal. 1 (1923) 29.

SUMATRA. Indragiri. Soepadmo 141, Pakanbaru, Tenajan R. — Palembang. Forbes 3232, Benting Teluk, Rawas R.

BORNEO. Sarawak. Beccari 2272, Matang. — Sabah. SAN 17467, Andalau For. Res.

5. *Urnularia lanceolata* Markgr., *nov. sp.*

Frutex scandens glaber. Ramuli teretes lenticellosi. Folia coriacea, lanceolata, longiuscule acuminata, 5—8,5 × 1,8—3,5 cm; nervi laterales 10—14 paria, 4—5 mm inter se distantes, angulo 30° ascendentes, rete tertiarium horizontale, tenue, versus nervos secundarios obliquum; petiolus crassiusculus, 8—10 mm. Inflorescentiae axillares, thyrsoidae, 3 × 2 cm, pedunculus 1 cm longus 1 mm crassus, rachis binodis. Lobi calycis ovati, 1,2 mm longi. Corollae tubus 3 mm longus, lobi 2,5 × 1 mm. Antherae 0,7 mm. Ovarium conicum, 1,2 mm altum. Fructus globosus, 6 cm. Semina ellipsoidea, applanata, 15 × 10 × 5 mm.

BORNEO. Sabah. Mt. Kinabalu: Clemens 26209 A, Tenompok, alt. 1500 m, 1-9-1931, fr.; 40106, Penibukan Ridge, forest hill, alt. 1200 m, 17-9-1933, fl. (holotype L); 40197, Pentaran Basin, alt. 1350 m, 28-8-1933, fl.; Mujin SAN 33898, Jalan Lering, Sosopodon, alt. 1350 m, 13-7-1963, fl.; RSNB 7045, Mesilau R., alt. 1350 m, 1-5-1964, fr.

6. *Urnularia rufescens* (Hook. f.) Stapf ex Sp. Moore, J. of Bot. 63 (1925) Suppl. p. 67; Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948) 155. — *Willughbeia rufescens* Dyer ex Hook. f., Fl. Br. Ind. 3 (1882) 626. — *Willughbeia flavescens* var. *rufescens* Ridl., Fl. Mal. Pen. 2 (1923) 325.

Distribution. Malay Peninsula (Pattani, Wellesley, P. Penang, Negri Sembilan, Malacca, Singapore).

7. *Urnularia javanica* (Bl.) Stapf, Hook. Ic. (1901) t. 2711 p. 2. — *Willughbeia javanica* Bl., Bijdr. (1826) 1024. — *Ancylocladus javanicus* O. Ktze, Rev. Gen. 1 (1891) 412.

Distribution. Java: 'Formerly locally in West Java' (Back. & Bakh. f., Fl. Java 2, 1965, 224). One sheet in L inscribed by Blume 'G. Seribù' (n. 881).

Note. One of the samples in L, collected by Blume, seems to represent a juvenile form: leaves elongate, in general 11×3.5 cm, up to 15×4 cm, nerves less close, intercalated veins few, veins often bending down outward, oblique to the nerves.

7. WILLUGHBEIA

Roxb., Pl. Corom. 3 (1819) t. 280; Fl. Ind. 2 (1832) 57; Bl., Bijdr. (1826) 1023; DC., Prodr. 8 (1844) 321; Miq., Fl. Ind. Bat. 2 (1856) 389; B. & H., Gen. Pl. II, 2 (1876) 691; Hook. f., Fl. Br. Ind. 3 (1882) 623; Boerl., Handl. 2 (1891) 350; K. Schum. in E. & P., Nat. Pfl. Fam. IV, 2 (1895) 130; Boerl., Bull. Inst. Bot. Btztg 5 (1900) 4; Hallier, Jahrb. Hamb. Wiss. Anst. 17, Beih. 3 (1900) 141; K. & G., Mat. Fl. Mal. Pen. (1907) 391; Ridl., Fl. Mal. Pen. 2 (1923) 322; Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948) 153; Bakh. f., Blumea 6 (1950) 385; Back. & Bakh. f., Fl. Java 2 (1965) 223. — *Ancylocladus* Wall., Pl. As. Rar. 3 (1832) 45; Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 94.

Glabrous lianas with branched axillary tendrils. Leaves decussate, coriaceous or subcoriaceous, petiolate, not glandular, with rather straight nerves. Inflorescences axillary, congested, short-peduncled or sessile, about as long as the petiole of the subtending leaf (longer in *W. anomala*), thyrsoid, with 1 or 2 nodes and short branches. Flowers small, pentamerous. Pedicels with 1 or 2 bracteoles. Calyx lobes ciliate, orbicular to ovate-oblong, without glands inside. Corolla white to yellowish, hypocrateriform, tube cylindrical, slightly inflated below or above the middle, without mouth scales. lobes overlapping to the left, oblong, obtuse, auriculate, generally longer than the tube, forming an oblong, obtuse bud, not inflexed. Stamens inserted in the inflated part, anthers oblong-ovate, shortly apiculate, with rounded base. Ovary generally superior, glabrous, conical, syncarpous, bicarpellate, unilocular, multiovulate. Style short. Stigma head turbinate, with two short or long apical appendages, reaching the anthers. Fruit a large mostly yellow berry with edible pulp. Seeds numerous, black, compressed-ellipsoidal, exalbuminous, 1—2 cm long; embryo with thick cotyledons, at their base completely enveloping the very short radicle.

Distribution. About 15 species, one in Ceylon, the others from Assam through Thailand, Indochina, and the Malay Peninsula to Sumatra, Java, Borneo, and Palawan.

Note. The genus stands next to *Urnularia* which differs by a globose corolla tube, by loose, mostly slender inflorescences longer than the petiole of the subtending leaf, therefore by fruits with a longer stalk.

The tendrils are modified inflorescences like in *Urnularia*, *Clitandra* (Africa), and *Landolphia* (Africa and South America).

Low sterile plants have been observed of *W. dulcis*, *angustifolia*, and *coriacea*, bearing elongate leaves with more distant nerves. Apparently, they represent a youth form as suggested also by Mr. Burkill who collected them several times in Pahang.

KEY TO THE SPECIES

1. Leaves glaucous below, broad-elliptic, with 6—8 pairs of rather strongly curved nerves, strongly coriaceous. Flowers large: corolla tube 12 mm long, lobes 20×7 mm¹). Stigma head with long appendages. Fruit globose, 6 cm 1. *W. grandiflora*

¹) The measurements are taken from fully developed flowers and from ripe fruits. Buds, even if they seem just about to open, may still grow remarkably!

1. Leaves not glaucous below, with 10—20 pairs of straight nerves. Flowers generally smaller.
2. Venation of the leaves indistinct below (see also *W. elmeri* with slender inflorescences). Inflorescences stout. Corolla lobes about 10 mm long.
3. Leaves coriaceous or subcoriaceous, opaque below; nerves 6—15 pairs, 5—15 mm distant, angle to midrib 60—70°. Corolla tube shorter than the lobes, about 6 mm long, lobes about 10 × 1.5—2 mm, their bud fairly obtuse.
4. Leaves broad-elliptic, round-acuminate, with rounded base. Inflorescences pubescent except the corollas. Fruit oblong, up to 12 × 5 cm 2. *W. oblonga*
4. Leaves elliptic, acute or acuminate by straight borders, with roundly narrowed base, often somewhat fleshy. Inflorescences glabrous (except the ciliate calyx lobes). Fruit ellipsoid, or subglobose, or very slightly obovate, about 9 × 3 cm. 3. *W. coriacea*
3. Leaves moderately coriaceous, shining below; nerves 16—20 pairs, 4—6 mm distant, angle to midrib 80—90°. Corolla tube longer than the lobes, about 13 mm, lobes 10 × 0.7 mm, their bud acutish. Fruit pear-shaped, up to 15 × 12 cm 4. *W. tenuiflora*
2. Venation of the leaves distinct below (except in *W. elmeri*).
5. Veins almost perpendicular to the nerves, meeting between every two of them in a narrow strip of network. Leaves with rounded base (except in *W. anomala*), longer than 10 cm.
6. Leaves narrow, with cuneate base, finely papillose-velvety below. Inflorescences loose, longer than the petiole of the subtending leaf. Corolla tube 12 mm long. Stamens inserted in the lower tenth of the corolla tube. 10. *W. anomala*
6. Leaves with rounded base, smooth below. Inflorescences congested, not longer than the petiole of the subtending leaf. Corolla tube 3.5—6.5 mm long. Stamens inserted in at least the lower third of the corolla tube.
7. Leaves 14—25 × 7.5—11 cm, thick-coriaceous, glossy above. Inflorescences glabrous. Corolla tube 3.5 mm long, lobes 5 × 1.8 mm. Stamens in the upper third of the corolla tube. Ovary superior, 0.7 mm high. Fruit ellipsoid, 14 × 9.5 cm. 5. *W. gigantea*
7. Leaves 10—20 × 5—8 cm, less coriaceous, not or slightly shining above. Inflorescences rusty-pubescent. Corolla tube 6.5 mm long, lobes 4 × 1.5 mm. Stamens in the lower third of the corolla tube. Ovary half-inferior, its free part 0.3 mm high. Fruit globose, 8 cm Ø 6. *W. sarawacensis*
5. Between the nerves intercalated veins parallel to them and a tertiary network between them all. Leaves with a narrowed base, not or rarely longer than 10 cm. Fruit globose, about 7 cm Ø.
8. Leaves oblong-elliptic, with 12—15 nerves and as many intercalated veins, subchartaceous or subcoriaceous. Inflorescences stout. Pedicels 1—2 mm long, 0.7 mm broad. Corolla lobes broader than 1 mm 7. *W. dulcis*
8. Leaves elliptic, with 8—10 nerves and as many intercalated veins. Inflorescences slender. Pedicels 3—4 mm long and 0.3 mm broad or less.
9. Leaves subcoriaceous, elliptic, short-acuminate, 7—10 × 3—4.5 cm, with indistinct nervation. Corolla tube 2 mm long, lobes 4.5 × 1 mm 8. *W. elmeri*
9. Leaves subcoriaceous or coriaceous, either elliptic and 6—10 × 2.5—3.4 cm, or short-elliptic and 4—7 × 2.5—4 cm, or lanceolate and 4—7 × 1.5—2 cm; nervation distinct below. Corolla tube 1.5 mm long, lobes 2.5 × 0.8 mm 9. *W. angustifolia*

1. *Willughbeia grandiflora* Dyer ex Hook. f., Fl. Br. Ind. 3 (1882) 625; Boerl., Handl. 2 (1899) 391; Ridl., Fl. Mal. Pen. 2 (1923) 322. — *Ancylocladus glaucinus* Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 98. — *W. glaucina* K. Sch. in E. & P., Nat. Pfl. Fam. Nachtr. 2 (1900) 55.

MALAY PENINSULA. Selangor. SFN 34094, Sungai Tinggi, Kuala Selangor. — Malacca. Maingay KD 1047 (holotype K). — Johore. Kadim & Nur 320, Endau, Kampong Hubong. — Singapore. Ridley s.n., P. Ubin, 1893.

BORNEO. Sarawak. Beccari PB 3335 (type of *Ancylocladus glaucinus*; holo in P); PB 3338, Marop; Haviland 2301, Kuching; 3045, Bintulu; Sanusi bin Tahir S 9764, Dist. Sibuan, Naman For. Res.; S 12893, Dist. Binatang, Sg. Semulun, P. Brui. — Brunei. Van Niel 3971, Kuala Belait.

2. *Willughbeia oblonga* Dyer ex Hook. f., Fl. Br. Ind. 3 (1882) 625; Boerl., Handl. 2 (1899) 391; Ridl., Fl. Mal. Pen. 2 (1923) 323.

MALAY PENINSULA. Kedah. KEP FRI 13691, low SE. slope of Bukit Perak, calcareous rock, sec. for., alt. 450 m; Corner 30299, Kemaman, Bukit Kajang. — Selangor. KEP FRI 7999, Ulu Endau, Labis

For. Res., undulating lowland for. — Malacca. Derry 399, Bukit Bruang; Goodenough 1396, Ayer Panas; Maingay KD 1089 (holotype, K).

SUMATRA. Indragiri. Buwalda 6297, Pangian.

3. *Willughbeia coriacea* Wall. [Catal. (1829) n. 1620, *nom. nud.*] Pl. As. Rar. 3 (1832) 45; G. Don, Gen. Syst. 4 (1837) 102; DC., Prodr. 8 (1844) 321; Hook. f., Fl. Br. Ind. 3 (1882) 623; Miq., Fl. Ind. Bat. 2 (1856) 391; Boerl., Handl. 2 (1899) 391; Ridl., Fl. Mal. Pen. 2 (1923) 323. — *W. firma* Bl., Mus. Bot. Lugd.-Bat. 1 (1850) 154, incl. var. *oblongifolia*; Miq., Fl. Ind. Bat. 2 (1856) 391; Sum. (1861) 227, 551; Hook. f., Fl. Br. Ind. 3 (1882) 624; Boerl., Handl. 2 (1899) 391; Bull. Inst. Bot. Btzig 5 (1900) 4, incl. var. *platyphylla*, *obtusifolia*, and *macrophylla*; Ridl., Fl. Mal. Pen. 2 (1923) 323; Back. & Bakh. f., Fl. Java 2 (1965) 224. — *W. burbridgei* Dyer, Kew Report (1880) 44. — *Ancylodadus minutiflorus* Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 95. — *Ancylodadus vriesianus* Pierre, l.c. 96. — *Ancylodadus nodosus* Pierre, l.c. 96. — *W. minutiflora* (Pierre) K. Sch. in E. & P., Nat. Pfl. Fam. Nachtr. 2 (1900) 55. — *W. vriesiana* (Pierre) K. Sch., l.c. — *W. nodosa* (Pierre) K. Sch., l.c.

SUMATRA. Korthals 1042 (Type of *W. firma*). — Tapanoeli. Rahmat si Boeea 11091, Toba, Talun na Uli, near headwaters of Aek Mandosi. — West Coast. Ichlas 43, Pajakumbu, Mt. Sago, Djalan Puntjak, alt. 1000 m; Meijer 4664, forest near Bukit Tjempago, alt. 1000 m; Teijsmann HB 1168, Sidjungdjung. — East Coast. Krukoff 4329, Huta Padang, forests on red soil; Rahmat si Boeea 10920, Asahan, Aek Garunggang, E. of Dolok si Manuk Manuk. — Palembang. Grashoff 886, Banjuassin and Kubu area; Lambach 1355, Lematang Ulu, alt. 150 m. — Simaloe. Achmad 892; 1652, Tapah. — Batoc Is. unknown coll. 17. — Banka. Kostermans & Anta 1343, G. Maras, alt. 100 m, granitic sand. — Lingga Arch. Bünnemeijer 6972, Pasir Pandjang, alt. 100 m.

MALAY PENINSULA. Peninsular Thailand. Kerr 7386, 7415, Pattani, Banang. — Perak. Haniff & Nur 2396, Taiping Hill, alt. 300 m; King's coll. 10050, Ulu Bubong, alt. 90—150 m, mixed for.; 10854, alt. 120—180 m, open jungle; Wray 5, Larut, Waterfall Hill, alt. 450 m; 59, upper Perak, Kenaing; 4176, Selama. — Dindings. Curtis 1629, Pankor, G. Sunggal. — Kelantan. Gimlette s.n., Pasir Lalat, Kuala Lebir. — Pahang. SF 21955, s. Sat, Ulu Tembeling. — Selangor. KEP 94531, Kemahan For. Res., Tanah Merah, sec. for.; 99030, Bt. Lagong, K.L., prim. for., hillside; KL 1585, Ulu Langat, Bt. Tankol, K. Pansom, hill for. — Negri Sembilan. Malvins 2300, Rantan; Purselove 4343, Port Dickson, near coast. — Malacca. Curtis 3476, Ayer Panas; 3485; Derry 101; 120, Bt. Sadanen, alt. 270 m; 490, 1198; Maingay 1048; Malvins 270; Ridley 399. — Johore. SF 32000, Sungei Kayu. — P. Langkawi. Curtis s.n., 11-1901. — P. Penang. Curtis 1500, waterfall; s.n., 7-1900, Government Hill, alt. 240 m; Ridley 847; 9359, Penang Hill, alt. 150 m; s.n., Balik Pulau, 6-1898, fl. — Singapore. Burkill 3041, Mac Ritchie catchment area; Gamble 2725, Changi; 4431; Henderson s.n., Bt. Timah Res.; Hullett 511; Nur s.n., Chan Chu Kang, 3-1894, fr.; Ridley 292, Bojuc; 2712, Janglin; 35944, Tanjong Gol; 4431; 9501, P. Ubu; s.n., Krangi, woodland, 7-1-1890, fl.; SF 40219; SP 5, Rogie Rd.

JAVA. West. Adelbert 295, Banten, Snaghijang, N. of Labuan, sec. for.; Rangkas Betung, Tjukakang (L.). — Bakh. f. in Blumea 6 (1950) 385: 'In recent time with certainty found only near Rangkas Betung and possibly also on Mt. Smeru.'

BORNEO. Sarawak. Beccari PB 1530, Mattang (type of *Ancylodadus nodosus*, P); Burbridge s.n., Lawas R., 1878 (type of *W. burbridgei*, K); Chew Wee-lek 1433, Santubong, foothills, alt. 75 m; Haviland 989, Lundu, Mt. Gading; 2168, near Kuching; s.n., path to Matang; Haviland & Hose 989, Baram; 3492, Kuching; Jacobs 5130, north slopes of Mt. Perissen (south of Kuching), alt. 1100—1200 m; Nooteboom & Chai 2185, Kalabit Highlands, Apa Batu Buli, alt. 1650 m; 2333, ditto, Batu Lawi, alt. 1450 m; Purselove 5422, Sungei Tau, alt. 90 m; S 21383, Miri, base of Bt. Lambir, alt. 50 m; SF 38326, Santubong; Treacher s.n., Lawas R., 8-10-1878. — Brunei. BRUN 3349, Ulu Senuko, Labu, alt. 120 m. — East and Northeast. Endert 4991, W. Kutei, near L. Puhus, alt. 100 m; Kostermans 10403, 10377, central Kutei, Belajan R. near Long Blek; 10653, ditto, near Tabang; 10595, ditto, G. Kelopok near Tabang; Winkler 3152, banks of S. Lawa. — Sabah. Carr 27086, Mt. Kinabalu, below path to Ranau, alt. 1450 m; Clemens 26063, 26063 bis, Mt. Kinabalu, Dallas, alt. 900 m; 31026, ditto, Penibukan, alt. 1200—1500 m; Evangelista 273, Kg. Kayo Madang; Ramos 1755, 1758, near Sandakan; Ridley 9055, Bongaya; RSNB 4888, Mt. Kinabalu, Mesilau R., alt. 1500 m; SAN 17074, Dist. Temburong, Kuala Belalong, alt. 200 m; SAN A 3500, Dist. Lahad Datu, P. Keruing, Kretam Besar R., Kretam; A 4041, Dist. Tawau, Kalabakan, 30 miles NW. of Tawau, alt. 70 m.

Note. Wallich (1832) made only mention of his *W. coriacea*, with too short a description. G. Don (1837) and DeCandolle (1844) could not do more. Thus Blume, when describing his *W. firma* from Sumatra (1850) could not presume that it was not different from *W. coriacea*. Miquel (1856) only followed Blume. Later authors always tried to maintain a difference. Only King & Gamble, *Mat. Fl. Mal. Pen.* (1907) 395, concede that the differences are unessential, such as distance and sharpness of the lateral nerves. Among the rich material which I had at my disposal these characters appeared to show numerous transitions, even in some numbers cited by these authors. I examined the two extremes microscopically: below the nerves the parenchyma is in the one case thick-walled, forcing the epidermis to arch out broadly, in the other it is thin-walled and arched over less broadly by the epidermis. Correspondingly, the larger vascular strands are accompanied by 5 or 6 layers of sclerenchyma, the smaller ones by 3. The spongy parenchyma may exceed the palissades 3 times, or only $1\frac{1}{2}$ time. These differences apparently depend on the degree of fleshiness of the leaves which does not prove to be constant. Moreover, the areas of the two species are the same.

4. *Willughbeia tenuiflora* Dyer ex Hook. f., *Fl. Br. Ind.* 3 (1882) 625; Boerl., *Handl.* 2 (1899) 391; Hallier, *Jahrb. Hamb. Wiss. Anst.* 17, *Beih.* 3 (1900) 144; Ridl., *Fl. Mal. Pen.* 2 (1923) 325. — *Ancylocladus curtisianus* Pierre, *Bull. Soc. Linn. Paris II*, 1 (1898) 97. — *W. curtisiana* (Pierre) K. Sch. in E. & P., *Nat. Pfl. Fam. Nachtr.* 2 (1900) 55.

SUMATRA. *van Romburgh* 409. — East Coast. *Rahmat si Toroes* 4012, Si Mandi Angin. — *Indragiri*. *Meijer* 4214, Taluk region. — *Benkoelen de Vriese s.n.*, Mandheleng. — *Palembang*. *Buwalda* 7631, forest of Semangus near Muara Enim; *Grashoff* 859, Banjuassin and Kubu region; 1054, Rawas, alt. 100 m; *Lambach s.n.*, Lematang Ulu, alt. 150 m.

MALAY PENINSULA. *Kedah*. *SF* 35192, Koh Mai For. Res. — *Dindings*. *Curtis s.n.*, -12-1902; *Ridley* 3075, Lumut. — *Kelantan*. *KEP FRI* 4505, Ulu Sg. Aring near K. Tapah. — *Selangor*. *CF* 4992, 16443, Sungei Buloh For. Res.; *SF* 12739, Ulu Gombak, hill slopes. — *Negri Sembilan*. *Holtum* 9533, G. Tampin. — *Malacca*. *Curtis* 3483; *Derry* 576, Bt. Bruang; *Goodenough* 100, 1785, Ayer Panas; *Maingay* 1049 (type of *W. tenuiflora*, K); *corporate Sam* 678. — *Johore*. *Holtum* *SF* 10965, G. Beridong. — *P. Penang*. *Curtis s.n.*, waterfall, 1890 (type of *Ancylocladus curtisianus*). — *Singapore*. *Corner s.n.*, MacRitchie Reservoir, 4-4-1937; *Ridley* 4826, Reservoir Wood; 11333, Bt. Timah; *SF* 40214.

5. *Willughbeia gigantea* (Boerl.) Markgraf, *nov. comb.* — *Leuconotis gigantea* Boerl., *Bull. Inst. Bot. Botzg* 5 (1900) 8, incl. var. *crassifolia* and var. *ovalis*.

SUMATRA. East Coast. *Rahmat si Toroes* 9313, Asahan, Aek Munte. — *Indragiri*. *Soepadmo* 224, Pakanbaru, Tenjan R. — cultivated: *Lörzing* 8454, Sibolangit, alt. 450 m.

BORNEO. *Sarawak*. *Beccari s.n.*, Kuching. — *Brunei*. *BRUN* 2633, Ulu Lumut, Andalau For. Res., prim. for. on sandy clay. — *West. van Romburgh* 7 (*n. v.*), Simpolan Angin, beyond Petani; 34, Kophiang; 53, Biang.

6. *Willughbeia sarawacensis* (Pierre) K. Sch. in E. & P., *Nat. Pfl. Fam. Nachtr.* 2 (1900) 55. — [*W. treacheri* Dyer, *Kew Rep.* (1880) 44, *nomen*] — *Ancylocladus sarawhaensis* Pierre, *Bull. Soc. Linn. Paris II*, 1 (1898) 96, *sphalm.* — *W. sarawakensis* Becc., *For. Borneo* (1902) 603, orthogr. variant.

BORNEO. *Sarawak*. *Beccari* 3925, banks of R. Igau, Buah Tabu, (type); *Sarawak For. Dept.* *S* 29963, Anap, Ulu Kakus, river bank. — *Sabah*. *BS* 1727, Batu Lima, damp for. — *sine loc. de Vriese* 152.

PHILIPPINES. *Palawan*. *PNH* 12491, Aborlan, Mt. Graan, dense for.; 23063, Aborlan, Sagpangan.

Note. This seems to be the species cited by Boerlage and others as *W. edulis* Roxb. for Borneo. It is indeed related to that species which occurs in India (Assam, Upper and

Lower Burma) and in Upper Thailand. Furthermore, it is related to *W. cochinchinensis* Pierre from Cambodia and Cochinchina. Regarding *W. edulis* in the Malay Peninsula see also under '*Species exclusae and incertae*'.

7. *Willughbeia dulcis* Ridl., Trans. Linn. Soc. London II, 3 (1893) 319; Fl. Mal. Pen. 2 (1923) 325; Kerr, Fl. Siam. En. 2 (1939) 423; Burk., Dict. (1966) 2301. — *W. martabanica* auct. non Wall.: K. & G., Mat. Fl. Mal. Pen. (1907) 395.

MALAY PENINSULA. Peninsular Thailand. Kerr 14217, Satun, Terutao; 14511, Songkhla. — Perak. SF 34573, Sungai Krian. — Pahang. Burkill & Haniff 15745, 15776, Panjom near Kuala Lipis; 16058, Kuala Tembeling; 16990, Batu Talam; 17624, Beserah; Ridley 1022, Praman near Pekan; Woods 1704, Fort Iskander; Yeob 3187, Ulu Rompin. — Malacca. Goodenough 1450, Bt. Sedanan; Malvins 1146. — P. Penang. Nur 6883, Waterfall Garden. — Johore. Teruya 215, Kota Tinggi, Nam Heng Estate. — Singapore. Burkill s.n., Tamping, 8-4-1916; SF 40240, Pasir Ris.

8. *Willughbeia elmeri* Merr., Univ. Calif. Publ. Bot. 15 (1929) 253; Tsiang, Sunyatsenia 2 (1934) 94; Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948) 153.

BORNEO. Sarawak. Burbridge s.n., Lawas R., 1878; S 21822, Ulu Mayeng, Kakus, basalt hillside, alt. 200 m, mixed Dipterocarp for. — Brunei. BRUN 447, Belalong R., Temburong, prim. for. on river bank, yellow sandy clay. — East. Endert 3854, W. Kutai, near Mt. Kemul, alt. 1200 m, mountain ridge for. — Sabah. CF 4856, Kabili For. Res.; Elmer 21038 (type), 21486, Tawau; SAN 24957, Tawau, Kalabakan For. Res.; 39803, entrance to Jalan Hujung Tanjong near Sepetur; 51234, Bt. Senilakan, Ulu Menaman, NW. of Kuala Tonged; 51951, Lamag Dist., Abai Kinabetangan, prim. for., seasonal swamp.

9. *Willughbeia angustifolia* (Miq.) Markgraf, nov. comb. — *Vahea angustifolia* Miq., Fl. Ind. Bat. 2 (1857) 394. — *W. apiculata* Miq., Sum. (1861) 227, 551; Boerl., Handl. 2 (1899) 392; Bull. Inst. Bot. Btzg 5 (1900) 6; Hallier, Jahrb. Hamb. Wiss. Anst. 17, Beih. 3 (1900) 144; Posthumus, Leidsche Geol. Meded. 5 (1931) 503; Heyne, Nutt. Pl. ed. 2 (1927) 1272. — *Ancylodadus minutiflorus* Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 95. — *W. minutiflora* (Pierre) K. Sch. in E. & P., Nat. Pfl. Fam. Nachtr. 2 (1900) 55; Merr., Born. (1921) 496.

var. *angustifolia*

SUMATRA. Tapanoeli. H.B. 990, Batang Barus. — West Coast. Beccari PS 938, Padang, Sungai Bulu; Diepenhorst 2088, Priaman (type of *Vahea angustifolia*); H.B. 2140, ditto (type of *W. apiculata*). — Lampung Districts. Bruinsma 16. — Banka. Kostermans & Anta 129, 404, Lobok Bezar, granitic sand; Teijsmann s.n., Muntok. — Billiton. Riedel s.n., 1876; Teijsmann 11039, 11040, P. Frandoes. — sine loc.: De Vriese s.n.

MALAY PENINSULA. Wellesley. Ridley 9389, Kruai. — Perak. SFN 34573, Sungai Krian. — Pahang. Haniff & Nur 8090, G. Tahan; KEP 100103, Ulu Krau, prim. for., hillside; KEP FRI 3662, Aur For. Res., river banks. — Negri Sembilan. Burkill 1304, 3206, Tamping. — Johore. KEP FRI 7626, Tg. Penawar, coastal fringe for. — P. Penang. Ridley s.n., Balik Dulau, -6-1898. — Singapore. Ridley 3996, Changri Rd.; 6023, Changri; 6047, Sungai Quram; 6143, Chan Chu Kang.

BORNEO. Sarawak. Beccari PB 307, Kuching; PB 1972, Matang; PB 4030, banks of Bintulu; Sarawak For. Dept S 8637, Bintulu, Simijalau For. Res.; S 15778, Kuching, Semengoh For. Res., prim. lowland Dipterocarp for.; S 29608, 3rd Div., Kapit, Sg. Mengiong Balleh, mixed Dipterocarp for., yellow sandy clay. — Brunei. BRUN 440, Ulu Belalong, Temburong, prim. for., yellow sandy clay, tertiary sandstone ridge; 845, Berakas For. Res., old sec. for. on flat peaty alluvial land; 10449, Andalau For. Res., lowland for.; van Niel 4050, Belait, near mouth of Lumut R., open belukar, white sandy soil; 4274, Belait, Seria, edge of swamp for. — North-east. Kostermans 5832, E. Kutei, G. Sekrat, south of Sangkulirang, alt. 400-500 m, coral limestone rocks. — Sabah. SAN 24889, Sepilok, prim. for. on ridge.

var. *gracilior* Markgraf, nov. var.

Folia lanceolata, 4-7(-13) × 1,5-2(-3,5) cm.

SUMATRA. Banka. Kostermans 234, Lombok Bezar, granitic sand.

BORNEO. Sarawak. Nooteboom 2087, Kalabit Highlands, hills near Kg. Pa Lungan, alt. 1100 m,

disturbed prim. for. — East. *Endert 3562*, W. Kutei, near Mt. Kemul, mountain ridge, alt. 1200 m (type). — Sabah. *SAN 15258*, Sipitang, Sibubu R., Mengalong For. Res.; *24899*, Sepilok, prim. for. on ridge; *50985*, Kuala Penyu, prim. for.

Note. The type of *W. apiculata* Miq. has the sunken stomata with tap-like structures around them as described by Hallier (p. 139) and undulated lateral epidermis walls. By these characters it is possible to distinguish it from *Melodinus orientalis* Bl. with which it had been confounded by Boerlage because of a great resemblance in the leaves, but which has the lateral walls slender and not waved. A cross section shows that the taps are only locally stronger thickenings in the outer wall layers of the neighbouring cells. In older leaves they seem to become equalized.

10. *Willughbeia anomala* Markgraf, nov. sp.

Frutex alte scandens. Ramuli compressi. Folia subcoriacea, glabra, lanceolato-elliptico-oblonga, apice rotundato-acuminata, basi cuneata, 9—12 × 3,5 cm, subtus papilloso-velutina. Nervi laterales 14—18 paria, distincti, paulo curvati, 5—8 mm distantes, nervi tertiarii secundariis transversi. Petiolus 1 cm longus, crassiusculus. Inflorescentiae laxae, erectae, iteratim dichasiales, 4 cm longae, breviter puberulae, bracteatae. Pedunculus 5—10 mm longus, pedicelli 3 mm longi. Calycis lobi ovati, 1,2 mm longi, extus pubescentes. Corollae albae, odoratae, tubus extus pubescens secus 5 lineas longitudinales, 12 mm longus, 1 mm latus, 1 mm supra basin paulo inflatus, in fauce pilosus, 7 by 2 mm. Stamina 1 mm supra basin tubi inserta, antherae 1,2 mm longae. Caput stigmatis sessile, 0,8 mm longum. Ovarium glabrum, breviter cylindricum, 0,4 mm altum.

BORNEO. Sarawak. *Sarawak For. Dept S 12502*, G. Matang, alt. 60 m, prim. for. — Brunei. Ashton *BRUN 600*, Andalau For. Res., disturbed for. on deep yellow sands overlying tertiary clays, low undulating hills. — Sabah. *SAN 17525*, Sandakan Dist., Kuala Belait, Andalau For. Res. (holotype, L).

Note. The loose inflorescence is quite uncommon in *Willughbeia*, differs, however, from the slender inflorescence of *Urnularia*.

SPECIES EXCLUSAE ET INCERTAE

Willughbeia borneensis Merr., J. As. Soc. Mal. 1 (1923) 28 = *Leuconotis anceps* Jack.

Willughbeia celebica Bl., Mus. Lugd. Bat. 1 (1850) 154. Type not found.

Willughbeia drupacea Blco, Fl. Filip. (1837) 132 = *Ardisia squamulosa* Presl (according to Merr., En. Philip. 3, 1923, 264).

Willughbeia elliptifolia Quis. & Merr. = *Melodinus elliptifolius* (Quis. & Merr.) Pichon.

Willughbeia edulis Roxb., Pl. Corom. 3 (1819) pl. 280, has been cited for the Malay Peninsula, Dindings (*Curtis 1629*) by K. & G., Mat. Fl. Mal. Pen. (1907) 393, and by Ridl., Fl. Mal. Pen. 2 (1923) 323, for Perak too (*Haniff & Nur 2396*). The specimens cited represent *W. coriacea* Wall., however.

Willughbeia luzoniensis Merr., Philip. J. Sc. 4 (1909) Bot. 320 = *Melodinus luzoniensis* (Merr.) Pichon.

Willughbeia multilocularis Blco, Fl. Filip. (1837) 131 = *Ardisia squamulosa* Presl (according to Merr., En. Philip. 3, 1923, 264).

Willughbeia novoguineensis Wernh., Trans. Linn. Soc. Bot II, 9 (1916) 108 = *Melodinus novoguineensis* (Wernh.) Pichon.

Willughbeia pauciflora Merr., Phil. J. Sc. 8 (1913) Bot. 387 = *Melodinus luzoniensis* (Merr.) Pichon.

Willughbeia umbrosa Bl., Mus. Lugd. Bat. 1 (1850) 154 = *Melodinus orientalis* Bl.
Willughbeia unilocularis 'Blco' ex Pichon, Mém. Mus. Hist. Nat. Paris II, 24 (1948)
 153. Not found, not even a description.

8. KOPSIA BL.

A unique peculiarity of most species of this genus is the nose-like ventral appendage of the mericarp (see f. 2). It is a cavity completely secluded from the seed-bearing portion by a wall. It descends ventrally from the top to more than half the length of the fruit. Its whole upper edge is open towards the surrounding air, from the top to its utmost protruding point. The inner surface of this open appendage is covered by a large-celled, thin-walled parenchyma, through which run surprisingly broad vascular bundles consisting only of tracheids without fibres. They take their origin from the wall of the appendage, where they are less broad, but include some narrow ring vessels.

Two Indochinese and two Hainan species and the Malesian *K. arborea* have a simple, plum-shaped mericarp without this ventral nose. Nevertheless in *K. arborea* the cavity is present as well. It lies enclosed in the upper half of the ventral face of the mericarp without protruding. In younger fruits one may see there a narrow line that later on becomes broader, covering the cavity only as a thin exocarp which occasionally shows some holes.

The inflorescences may look rather different according to their age. As a rule they or their branches begin as di- or trichasia and end in cincinnate monochasia. These produce one flower after the other. Thus a young inflorescence may look rather short and dense, whereas after several flowering periods of the plant there may have developed a long sympodium with empty bracts crowned by one flower at the top.

The evolutionary trend within the genus apparently may be found in a reduction of the inflorescence. Beginning by a loose, rich thyrsoid type, represented by *K. arborea*, the reduction goes through rich loose di- or trichasia, as in *K. fruticosa*, *K. griffithii*, *K. singapurensis*, towards less rich dichasia, in which the cincinnate branches prevail over the forked parts (e.g. in *K. lapidilecta*, *K. larutensis*, *K. macrophylla*), then to purely cinnate types, ending in the single cincinnus of *K. mitrephora*. It is remarkable that in *K. arborea* the primitive character of the inflorescence is linked to the primitive character of the fruit.

Unfortunately these steps of the inflorescence are not always well discernable in herbarium specimens and in incompletely developed plants. But another character has proved specifically constant enough and may be advantageous for determination work: the different hairiness of the ovary, available even if the corollas have dropped. It lacks constancy to a certain degree only in *K. pauciflora*, which is rather variable in other respects too, and in *K. flavida*. Whereas the bulk of *pauciflora* specimens have short hairs on the ovary, some 8 Bornean specimens, mainly from Sandakan, have longer hairs (see p. 422). In the same regions, however, short-haired ovaries are found as well. In *K. flavida* several New Guinea specimens have a glabrous ovary, whereas others show a few very short hairs on its top. In both cases it seems not justified to found varieties on this gradual character.

In all species the leaf tip and the tip of the bracts and sepals bear an orbicular or elliptic gland on their dorsal face. As yet this has been mentioned only in some species descriptions for the calyx lobes, but in fact it is characteristic for the whole genus, though it may easily be overlooked in dried material.

A minor character of these undergrowth treelets or shrubs are the very different sizes

of the leaves, otherwise well known in lianas. In *Kopsia* too one may find adult leaves half or even less as long and broad as others of the same species.

The two *disc scales* alternating with the carpels have a rather irregular nature. Their length in relation to the ovary is inconstant and does not aim a specific character.

KEY TO THE MALESIAN SPECIES

1. Leaves coriaceous. Joints of the inflorescence stout, 1.5–3 mm in diameter. (In weak plants occasionally more slender).
2. Branches of the inflorescence di- or trichasial, therefore often several flowers open at a time. Joints of the inflorescence 1.5–2 mm in diameter.
3. Joints of the inflorescence branches longer than their bracts. Corolla lobes narrow, 4–8 mm, mostly 6 mm broad.
4. Inflorescence thyrsoid (a main axis with alternate or opposite cymose branches). Calyx lobes acuminate, 2.5 by 1.6 mm. Ovary glabrous. Mericarp ellipsoidal, without ventral appendage, 2 by 1 cm. Leaves large, 10–22 by 3.5–8 cm, with arcuate lateral nerves. 1. *K. arborea*
4. Inflorescence purely cymose. Calyx lobes ovate, obtuse, 1.2–1.6 by 1.0 mm. Mericarp spindle-shaped, with a nose-like ventral appendage (unknown in *K. scortechinii* and *sleesiana*). Ovary with long white hairs. Leaves smaller, 9–15 by 4–6 cm, with straight lateral nerves and parallel intercalated veins.
5. Leaves subcoriaceous; lateral nerves arcuate, without regular intercalated veins. Corolla lobes 12–18 mm. Ovary glabrous 2. *K. scortechinii*
5. Leaves coriaceous, lateral nerves straight, regularly with parallel intercalated veins. Corolla lobes 20–25 by 4–8 mm. Ovary with long white hairs.
6. Leaves ovate-elliptic, gradually narrowed into the tip, sinuously narrowed at the base. Calyx lobes ovate. Corolla tube 25–35 mm, widened at the throat itself.
6. Leaves oblong, suddenly rounded into the tip, roundly narrowed at the base. Calyx lobes suborbicular. Corolla tube 20–25 mm, widened 2 mm below the throat
4. *K. sleesiana*
3. Joints of the inflorescence branches shorter than their bracts. Corolla lobes up to 12 mm broad.
7. Young twigs glabrous. Leaves broad-elliptic, 14–27 by 7–11 cm. Inflorescence glabrous, without a common peduncle, its branches long-peduncled (4–5 cm). Corolla tube 30–35 mm, lobes 14–20 mm, ciliate. Ovary with short white hairs on the top 5. *K. singapurensis*
7. Young twigs pubescent. Leaves oblong-elliptic, 10–22 by 3.5–8 cm. Inflorescence pubescent, common peduncle 5–15 mm, branch peduncles 4–8 mm. Corolla tube 25–45 mm, lobes 20–30 mm, not ciliate. Ovary with long white hairs. 6. *K. fruticosa*
2. Branches of the inflorescence cincinnate (rarely one of them forked once), therefore only 1 or 2 flowers open at the same time. Joints of the inflorescence 2–3 mm in diam.
8. Common peduncle short (0–2 cm), branch peduncles 0–2 mm. Joints shorter than their bracts. Calyx lobes ovate, not longer than 2 mm.
9. Inflorescence branches 2 mm in diam. Corolla lobes obtuse, 8–12 mm broad, tube 25–40 mm long.
10. Inflorescence glabrous; common peduncle 0–3 mm, one branch of the dichasium sometimes forked again. Corolla tube widened 2 mm below the throat.
11. Leaves 8–15(–20) by 3–4(–8) cm. Inflorescence 1–3 subsessile cincinni, or one dichasium with subsessile cinnate branches. Ovary with short (rarely longer) hairs on the top. Mericarp 2 cm long, with an obtuse, drooping ventral appendage
7. *K. pauciflora*
11. Leaves 10–23(–28) by 4–8(–10) cm. Inflorescence a subsessile dichasium with cinnate branches, one of them sometimes forked again; branch peduncles up to 1 cm. Ovary glabrous or with few short hairs on the top, Mericarp 3 cm long, with an acute, spreading ventral appendage 8. *K. flavida*
10. Inflorescence pubescent; common peduncle 8–20 mm. Corolla tube widened 8–10 mm below the throat. Branches of the dichasium always simple. Ovary with short hairs on the top
9. *K. macrophylla*
9. Inflorescence branches 3 mm in diam., sessile. Corolla lobes acute, 1–2 mm broad, tube 8–15 mm. Ovary glabrous.

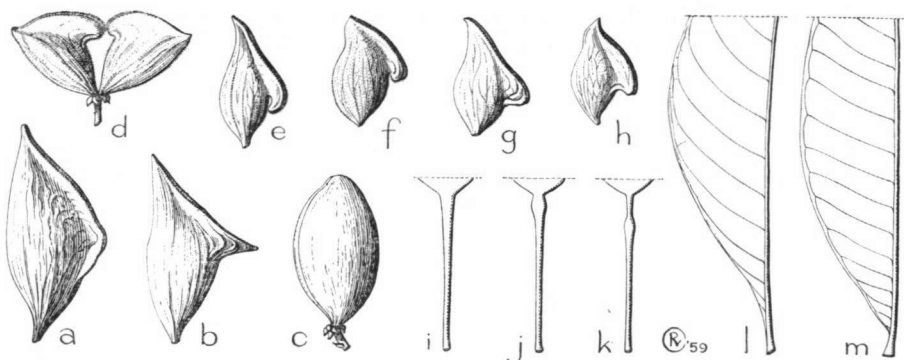


Fig. 1. *Kopsia singapurensis*: a. fruit, not quite ripe; i. corolla tube (SF 31959, $\times 1$). — *K. flavida*: b. fruit (Eyma 3171, $\times 1$). — *K. arborea*: c. fruit (Koorders 39000, $\times 1$). — *K. dasyrachis*: d. fruits (KEP 10435, $\times 1$); k. corolla tube (SAN A 1866, $\times 1$). — *K. pauciflora*: e. fruit (SF 11992, $\times 1$); m. part of leaf (KEP 35284, $\times \frac{1}{2}$). — *K. fruticosa*: f. fruit; j. corolla tube; l. part of leaf (f. Bakhuizen v. d. Brink 3099; j and l. Steiner 22835; f, j. $\times 1$, l. $\times \frac{1}{2}$). — *K. macrophylla*: g. fruit (KEP 15426, $\times 1$). — *K. mitrephora*: h. fruit (SAN 16118, $\times 1$).

12. Lateral nerves oblique (60° from the midrib) without intercalated veins. Inflorescence glabrous, consisting of one to several cincinni up to 3 cm long, with joints of 1 mm only. Common peduncle 0–5 mm. Corolla tube 8–10 mm, lobes 12 by 1 mm 10. *K. larutensis*
12. Lateral nerves subhorizontal (70° from the midrib), with parallel intercalated veins. Inflorescence pubescent, consisting of 2 sessile cincinni up to 10 cm long, joints 2–3 mm long. Common peduncle 15–20 mm. Corolla tube 15 mm, lobes 11 by 2 mm 11. *K. lapidilecta*
8. Inflorescence hirsute; common peduncle 2–6 cm, branch peduncles 10–20 mm; joints longer than their bracts. Calyx lobes oblong, pubescent, 2–3 mm long. Corolla tube widened 7 mm below the throat. Ovary densely short-haired on the top. 12. *K. dasyrachis*
1. Leaves chartaceous. Joints of the inflorescence slender, 1 mm or less in diam., even if well developed. 13. Joints of the inflorescence 0.5 mm in diam., longer than their bracts. Common peduncle 5–25 mm, branch peduncles 0.5–4 mm.
 14. Lateral nerves straight, 4–6 mm distant, with parallel intercalated veins. Corolla tube 12–14 mm, widened 2 mm below the throat, lobes 6 by 2 mm. Ovary glabrous. Adult inflorescence pendulous, its joints 15–30 mm long 13. *K. tenuis*
 14. Lateral nerves arcuate, 6–12 mm distant, without intercalated veins. Corolla tube 20–25 mm, widened 13 mm below the throat, lobes 20–25 by 6–8 mm. Ovary with long white hairs. 14. *K. profunda*
13. Joints of the inflorescence 1 mm in diam., shorter than their bracts. Common peduncle 0–5 mm, branches sessile.
 15. Leaves lance-elliptic, 2–4 cm broad, lateral nerves arcuate, 4–8 mm distant. Corolla tube 30–35 mm, widened 4–5 mm below the throat. Ovary with long white hairs 15. *K. mitrephora*
 15. Leaves narrowly lanceolate, 1–1.5 cm broad, lateral nerves straight, 2–4 mm distant. Corolla tube 25 mm, widened 3 mm below the throat. Ovary with short, stiff, brown bristles 16. *K. lancifolia*

ARTIFICIAL KEY FOR PLANTS WITH INCOMPLETE INFLORESCENCES

1st group. Ovary with long hairs.

1. Leaves coriaceous. (Inflorescence stout, loose). Corolla tube widened 0–2 mm below the throat.
 2. Leaves oblong, suddenly rounded into the tip. Calyx lobes suborbicular. Corolla tube 20–25 mm 4. *K. sleeseniana*
 2. Leaves elliptic-ovate, gradually narrowed into the tip. Calyx lobes ovate. Corolla tube 25–45 mm.
 3. Leaves 9–15 by 4–6 cm; lateral nerves rather straight, 4–8 mm distant, with parallel intercalated veins. Inflorescences glabrous.
 4. Common peduncle 10–40 mm; joints of the inflorescence longer than the bracts. Corolla lobes 20–25 by 4–8 mm 3. *K. griffithii*

- 4. Common peduncle 0—4 mm; joints of the inflorescence shorter than their bracts. Corolla lobes 16—20 by 8—12 mm. 7. *K. pauciflora*
- 3. Leaves 10—22 by 3.5—8 cm; lateral nerves arcuate, 10—12 mm distant, without intercalated veins. Inflorescences (and young twigs) pubescent 6. *K. fruticosa*
- 1. Leaves chartaceous. (Inflorescence slender). Corolla tube widened 4—13 mm below the throat.
- 5. Leaves without intercalated veins. Corolla tube 20—25 mm, widened 13 mm below the throat, lobes 20—25 by 6—8 mm 14. *K. profunda*
- 5. Leaves with intercalated veins. Corolla tube 30—35 mm, widened 4—5 mm below the throat, lobes 10—15 by 4.5—6 mm. 15. *K. mitrephora*

2nd group. Ovary with short hairs.

- 1. Twigs narrowly winged. Leaves narrowly lanceolate, chartaceous, 6—8 by 1—1.5 cm. Corolla lobes 12 by 4 mm, tube widened 3 mm below the throat 16. *K. lancifolia*
- 1. Young twigs quadrangular. Leaves elliptic, considerably longer and broader, coriaceous. Corolla lobes 14—20 by 8—12 mm.
- 2. Corolla tube widened more than 2 mm below the throat.
- 3. Calyx lobes oblong-acuminate, 2—3 mm, hirsute (as the inflorescence). Corolla tube widened 7 mm below the throat. 12. *K. dasyrachis*
- 3. Calyx lobes ovate, 2 mm, glabrous (as the inflorescence). Corolla tube widened 10 mm below the throat. 9. *K. macrophylla*
- 2. Corolla tube widened 2 mm below the throat.
- 4. Leaves large-elliptic. Calyx lobes oblong, up to 2.5 mm. Inflorescence peduncled
- 5. *K. singapurensis*
- 4. Leaves elliptic. Calyx lobes ovate, 1.2—2.0 mm. Inflorescence nearly sessile.
- 5. Leaves 8—15(—20) by 3—4(—8) cm. Appendage of the fruit drooping, obtuse
- 7. *K. pauciflora*
- 5. Leaves 12—28 by 4—10 cm. Fruit appendage spreading, acute 8. *K. flavida*

3rd group. Ovary glabrous.

- 1. Leaves subcoriaceous or chartaceous, 7—14 by 3—5 cm.
- 2. Lateral nerves arcuate, without parallel intercalated veins. Joints of the inflorescence 1—1.5 mm in diam., few mm long. Calyx lobes ovate-oblong, 1.6—2 by 1.1 mm. Corolla tube 20—25 mm, lobes 12—18 mm long 2. *K. scortechinii*
- 2. Lateral nerves straight, with parallel intercalated veins. Joints of the inflorescence 0.5 mm in diam., adult 15—30 mm long. Calyx lobes broad-ovate, 1 by 0.8 mm. Corolla tube 12—14 mm, lobes 6 mm long. 13. *K. tenuis*
- 1. Leaves coriaceous, 9—30 by 4—10 cm. Joints of inflorescence stout, 2 mm.
- 3. Leaves with intercalated veins, suddenly rounded into the tip. Calyx lobes suborbicular. Corolla red turning yellow, tube 15 mm, lobes 11 by 2 mm. 11. *K. lapidilecta*
- 3. Leaves without intercalated veins, gradually narrowed. Calyx lobes ovate to oblong. Corolla white, or white with red eye.
- 4. Nerves sharply prominent on the lower leaf surface. Corolla tube 8—10 mm, lobes 12 by 1 mm. Cincinni often crowded. 10. *K. larutensis*
- 4. Leaf nerves not sharply prominent. Corolla tube 20—30 mm. Inflorescence loose.
- 5. Calyx lobes ovate, 1.2—2 mm. Corolla lobes 20 by 10 mm. Inflorescence short-peduncled. Fruit with acute, spreading appendage. 8. *K. flavida*
- 5. Calyx lobes oblong, 2.5 mm. Corolla lobes 15 by 6 mm. Inflorescence long-peduncled. Fruit ellipsoid, without appendage 1. *K. arborea*

ENUMERATION OF THE MALESIAN SPECIES

1. *Kopsia arborea* Bl., Cat. Gew. Btzig (1823) 13; Flora 8, 1 (1825) 110; Bijdr. (1826) 1030; G. Don, Gard. Dict. 4 (1838) 100; DC., Prodr. 8 (1844) 352; Hassk., Flora 28 (1845) 264; Bl., Rumphia 4 (1849) 28, t. 181; Filet, Pl. Bot. Tuin Mil. Hosp. Weltev. (1855) 64; Hassk., Nat. Tijds. N. I. 10 (1856) 43; Miq., Fl. Ind. Bat. 2 (1857) 410; Hassk., Ned. Kruidk. Arch. 4 (1859) 10; Koord., Med. Lands Pl. Tuin 11 (1894) 81; K. & V., Bijdr. 1 (1894) 95; Koord., Atlas 4 (1918) t. 634; Timmerman-van der Sleesen, Found. Fl. Mal. Misc. Rec. 1 (1959) 9; Back. & Bakh. f., Fl. Java 2 (1965) 232. — *K. longiflora* Merr., Philip. Govt. Lab. Bull. 29 (1905) 47; Philip. J. Sc. 1 (1906) Suppl. p. 117; En. Philip. 3

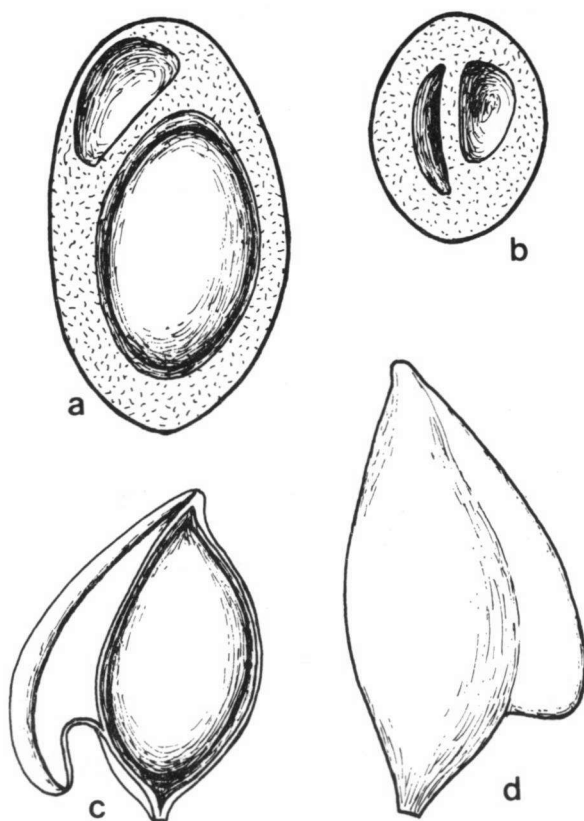


Fig. 2. Mericarp structure of *Kopsia*. — *K. arborea*: a. longitudinal section, above at left the cavity; b. cross section near the top, at right the upper end of the seed chamber. — *K. dasyrachis*: c. longitudinal section, at left the nose-like cavity. — *K. singapurensis*: d. ripe mericarp from outside. (All $\times 2$).

(1923) 330. — *K. laxinervia* Merr., Philip. J. Sc. 13 (1918) Bot. p. 55; En. Philip. 3 (1923) 330. — *K. pruniformis* Rchb. f. & Zoll. ex [T. & B., Cat. Hort. Bog. (1866) 125, *nom. nud.*] Bakh. f. [in Back., Bekn. Fl. Java em. ed. 7 (1948) fam. 72, p. 28, *nom. inval.*] Blumea 6 (1950) 391; Back. & Bakh. f., Fl. Java 2 (1965) 232. — *K. flavida* auct. non Bl.: K. & V., Bijdr. 1 (1894) 96; Koord., Atlas 4 (1916) t. 633 f. 1c; Merr., Philip. J. Sc. 29 (1926) 412. — Fig. 1 c; 2 a, b.

SUMATRA. Lampung Districts: Jacobs 8043, 8072, Mt. Tanggamus.

JAVA. West: 19 collections, incl. *Blume s.n.*, Mt. Salak, type of *K. arborea* (L. holo). — Central: Junghuhn *s.n.*, Medanie, Mt. Ungarang. — East: Koorders 119, Besuki, Dist. Djember; 23441, 23850, Pasuruan, Tangkil, Zuidergebergte; 29975, Puger; Zollinger 3832, Rogodjampi, type of *K. pruniformis*. — P. Panaitan: van Borssum Waalkes 260, north of mouth of Tjiharashas; 454, Mt. Putri. — Nusa Kambangan: Koorders 27006.

LESSER SUNDA ISLANDS. Bali: R. Maier 14, Brambang. — Tanimbar Is.: Bisset 698 = van Borssum Waalkes 4004, Yamdena, near Norkese, Ranarmoje R.

BORNEO. Sarawak: Beccari *s.n.*, Djanta an Tabù; Clemens 21211, upper Rejang R.; S 16033, Dist. Miri, G. Subis; S 17797, Rejang, Pelagus Rapids. — Southeast: Korthals *s.n.*, Mt. Sekumbang, 11-11-1836; Kostermans 7673, Peak of Balikpapan.

PHILIPPINES. Luzon: 9 collections, incl. BS 28232, Apayo Subprov., type of *K. laxinervia*. — Romblon: BS 31539; Elmer 12155. — Leyte: BS 41498, Cabalian. — Biliran: PNH 21521, Mt. Suero, north slope. — Cebu: PNH 92180, Balamban. — Sulu Is.: PNH 38852.

CELEBES. Salejer Is.: see Timmerman-van der Sleesen, l.c.

MOLUCCAS. Kai Is.: Jaheri 8.

N. QUEENSLAND. Schodde 4170, Mossman Gorge, 3 miles SW of Mossman.

Cultivated. Penang Waterfall Garden (Haniff 3667, SF 31601); Singapore S 142; Hort. Bot. Bogor IV A 52, X F 78, XV I IV 1.

2. *Kopsia scortechinii* K. & G., Mat. Fl. Mal. Pen. (1907) 431; Ridl., Fl. Mal. Pen. 2 (1923) 337; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 12.

MALAY PENINSULA. Perak: *Scortechinii* 57b; 1878, Bujong Melakka, type.

3. *Kopsia griffithii* K. & G., Mat. Fl. Mal. Pen. (1907) 432; Ridl., Fl. Mal. Pen. 2 (1923) 337; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 12. — *K. griffithii* var. *paucinervia* K. & G., l.c.; Ridl., l.c.; Henderson, J. Mal. Br. R. As. Soc. 17 (1939) 56.

MALAY PENINSULA. Perak: King's coll. 10707. — Selangor: 29 collections. — Negri Sembilan: Burkill 6396, Gemas. — Malacca: Griffith s.n., type of *K. griffithii*. — Johore: Lake & Kelsall s.n., Sungei Hulu Sembrong, 30-10-1892; SF 37067, Bt. Tinjau Laut.

4. *Kopsia sleeseniana* Markgr., nov. sp. — *K. sp.* Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 15.

Arbuscula vel frutex (?). *Folia* leviter coriacea, oblonga, basi sinuato-angustata, apice late rotundato-acuminata in caudam 8—10 mm longam, subtus glandula apicali ornatam, lamina 11—13 × 4—5 cm, supra lucida; nervi laterales distincti, subhorizontales, recti, principales 4—6 mm inter se distantes, ad 20 paria, nervis interstitialibus parallelis aucti, nervo marginali tenui 0,5 mm intra marginem coniuncti; petiolus 2—3 mm longus. *Inflorescentia* fortis (rachis et rami 1,5 mm crassi), glabra, cymosa, dichasialis, binodis, rami cincinnati. Pedunculus communis 1,5 cm longus, pedunculi secundarii 4—6 mm longi. Cincinnorum articuli 5—6 mm longi. Bractae ovatae, 1 mm longae, glandula dorsali infra apicem ornatae. *Calycis* lobi orbiculari-ovati, obtusi, 1,2—1,6 × 1,2 mm, ciliati. *Corollae* (albae?) tubus 20—25 mm longus, 2 mm latus, intus longe pilosus, 2 mm infra faucem constrictum pilosum ad 3 mm amplius et ibi staminifer; lobi oblongi, glabri, obtuse acuminati, 22 × 6 mm. *Antherae* oblongae, acutae, 2 mm longae; filamenta 0,8 mm longa. *Ovarium* pilis albis longis dense pilosum, 0,6 mm altum. *Squamae disci* ovario aequilongae. *Caput stigmatis* cylindricum, antheras paene attingens, apice breviter apiculatum, basi collo pendulo cinctum, 1,2 mm longum. *Stylus* 25 mm longus. *Fructus* desunt.

BORNEO. Sarawak: Haviland 3046, Bintulu, Kalong, type (SING holo; iso in SAR).

Notes. In its shining, oblong, many-nerved leaves, loose inflorescences, rather narrow corolla lobes, and long-haired ovary this species approaches *K. griffithii* of the Malay Peninsula. The latter differs mainly in its more lanceolate leaves, the more slender inflorescences, and the longer corolla tube which is not constricted in the throat.

This species is dedicated to Mrs. Timmerman-van der Sleesen, who, in collaboration with Dr. P. W. Leenhouts and Prof. Dr. C. G. G. J. van Steenis, worked out the first and convincing monograph of this genus, published in 1959 as Miscellaneous Record 1 of the Foundation Flora Malesiana.

5. *Kopsia singaporensis* Ridl., Fl. Mal. Pen. 2 (1923) 336; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 11, f. 1a, i. — *K. fruticosa* var. *albiflora* auct. non K. & G.: K. & G., Mat. Fl. Mal. Pen. (1907) 431 *pro specim.* — Fig. 1 a, i; 2 d.

MALAY PENINSULA. Perak: *Cantley s.n.* — Selangor: *KEP 80992*, G. Lesong F. R. — Johore: 13 collections. — Singapore: *Burkill 5977*, Mandai Rd.; *Cantley 3015*; *Kiah SF 37714*, Mandai Rd.; *Ridley 59*, Cham Chu Kang.

Cultivated. Kepong plantation field 17 M (*Abdul Hamid KEP 33852*); Singapore Bot. Gard. (*Furtado 236*, *SF 34864*).

6. *Kopsia fruticosa* (Ker) A. DC., Prodr. 8 (1844) 352; Hook. f., Fl. Br. Ind. 3 (1882) 639; Boerl., Handl. 2 (1899) 395; K. & G., Mat. Fl. Mal. Pen. (1907) 430; Merr., En. Born. (1921) 500; Tsiang, Sunyatsenia 2 (1934) 110; Craib, Fl. Siam. En. 2 (1939) 437; Bakh. f., Blumea 6 (1950) 390; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 15, f. 1f, l; Back. & Bakh. f., Fl. Java 2 (1965) 232. — *Cerbera fruticosa* Ker, Bot. Reg. (1819) t. 391; Spreng., Syst. Veg. 1 (1825) 641; Roxb., Fl. Ind. ed. Carey, 2 (1832) 526. — *K. vincaeflora* Bl., Bijdr. (1826) 1030; G. Don, Gard. Dict. 4 (1838) 100; DC., Prodr. 8 (1844) 352; Hassk., Flora 28 (1845) 264; Ned. Kruidk. Arch. 4 (1859) 11; Bakh. f., Blumea 6 (1950) 391. — *Calpicarpum roxburghii* G. Don, Gard. Dict. 4 (1838) 100; Miq., Fl. Ind. Bat. 2 (1857) 412. — **Fig. 1 f, j, l.**

D i s t r. This species is widely cultivated as an ornamental shrub and may have escaped from cultivation, so that its native country is not quite certain. The first introduction came from Lower Burma (Pegu) without taking account of its growing wild or not. Bakhuisen f. records it as indigenous in Sumatra. I saw only the following few specimens with locality notes suggesting their growing wild:

MALAY PENINSULA. Malacca: *Ridley 3186*, lower part of G. Sedan. — Johore: *Cockburn KEP FRI 7552*, Kluang F. R.

SUMATRA. East Coast. Lörzing 5500, Sibolangit. — Riouw Archipelago: *Bünnemeijer 5962*, P. Tudju, Ayer Suar.

7. *Kopsia pauciflora* Hook. f., Fl. Br. Ind. 3 (1882) 639; K. & G., Mat. Fl. Mal. Pen. (1907) 431; Ridl., Fl. Mal. Pen. 2 (1923) 338; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 14. — *K. parvifolia* Merr., Philip. J. Sc. 29 (1926) 412; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 8. — *K. caudata* Merr., Un. Cal. Publ. Bot. 15 (1929) 254, incl. var. *glabra*. — *K. alba* Ridl. ex Henderson, Gard. Bull. S. S. 5 (1930) 78; Craib, Fl. Siam. En. 2 (1939) 437; Henderson, J. Mal. Br. R. As. Soc. 17 (1939) 56. — **Fig. 1 e, m.**

MALAY PENINSULA. Peninsular Thailand: *Curtis 2937*, Puket, Pang-nga (= Poongah); *Kiah SF 24285*, Pattani, Bacho; *Smitinand 6577*, Kribi, Ao Luck. — Perak: *Welkinson FMS(KEP) 30319*, Piah F. R., Kerengga Pk. near Chenderoh dam. — Kelantan: *Foxworthy SF 11992*, Sungai Ketch; *Haniff & Nur SF 10093*, Kuala Krai; *MS 578*, Kpg. Gobek, Kerilla estate, Tamangan; *Unesco Limestone Exp. 529*, Gua Panjang, Ulu Kelantan. — Trengganu: *SF 33867*, Ulu Brang. — Negri Sembilan: *Alvins 1900*. — Malacca: *Maingay 1056*, Mt. Ophir, type of *K. pauciflora*. — P. Tioman: *Nur SF 18948*; *Ridley s.n.* -8-1889, type of *K. alba*.

BORNEO. Sarawak: *W. M. A. Brooke S 10159, 10164, 10185*, Maputi. — Brunei: *BRUN 310*, R. Batu-Apoi-Sebatu watershed; *BRUN 3101*, Belih Priok Puteh, Bt. Peradayan; *S 5794*, Bangar. — Sabah: 17 collections, incl. *Elmer 20130*, Myburgh Prov., type of *K. caudata*; *20615*, Tawao, Elphinstone Prov., type of *K. caudata* var. *glabra*. — Banguay I.: *Castro & Melegrito 1456*, type of *K. parvifolia*.

N o t e s. The relationship of the present species with *K. fruticosa* is also apparent from a certain similarity in habit, especially if the inflorescences are incomplete or too young. *K. fruticosa*, however, has long hairs on the ovary and the inflorescences are pilose up to the calyx; even the venation of the leaves is different: it runs across the nerves towards an irregular meeting zone between every two laterals. *K. pauciflora* has short, rarely longer hairs on the ovary and glabrous inflorescences, and its venation is drawn into a direction oblique to the laterals, resulting in elongated meshes.

The following specimens have longer hairs on the ovary: *Brooke S 10185*, *Castro & Melegrito 1456*, *Elmer 20130*, *SAN 18818*, *21625*, *56179*, *SAN A 3232*, *Valera 6723*.

8. *Kopsia flavida* Bl., *Rumphia* 4 (1849) 28; Hassk., *Nat. Tijds. N. I.* 10 (1856) 441; Miq., *Fl. Ind. Bat.* 2 (1857) 411; Timmerman-van der Sleen, *Found. Fl. Males. Misc. Rec.* 1 (1959) 10; non K. & V., *Bijdr.* 1 (1894) 96, *neque* Koord., *Atlas* 4 (1916) f. 633, *nec* Merr., *Philip. J. Sc.* 29 (1926) 412, *quae sunt K. arborea* Bl. — *Calpicarpum albiflorum* T. & B., *Nat. Tijds. N. I.* 25 (1863) 402. — *K. albiflora* (T. & B.) Boerl., *Handl.* 2 (1899) 395. — *Kentrochrosia monocarpa* Laut. & K. Sch. in K. Sch. & Laut., *Fl. Schutzgeb.* (1901) 506, t. 18; Markgr., *Nova Guinea* 14 (1926) 283; *Bot. Jahrb.* 61 (1927) 195. — *K. fruticosa* var. *albiflora* (T. & B.) K. & G., *Mat. Fl. Mal. Pen.* (1907) 431 *pro basionymo, specim. excl.* (see under *K. singapurensis* Ridl.). — *K. grandiflora* Merr., *Philip. J. Sc.* 20 (1922) 436; *En. Philip.* 3 (1923) 330. — *K. triangularis* Merr. & Quis., *Philip. J. Sc.* 37 (1928) 191. — *Kentrochrosia triangularis* (Merr. & Quis.) Merr. & Perry, *Philip. J. Sc.* 76 (1941) 21. — **Fig. 1 b.**

PHILIPPINES. Luzon: *BS 33691*, Prov. Camarines, Paracale, type of *K. grandiflora*. — Samar: *PNH 5823*, Tagaslian Borongan. — Mindanao: *Wenzel 2648* (type of *K. triangularis*), *2706*, Surigao.

MOLUCCAS. Buru: *de Vriese & Teijsmann s.n.* — Ceram: 7 collections.

NEW GUINEA. Batanta I.: *Beccari s.n.*, ~1875. — Southwest: *von Römer 103*, 141, Noord R.; *van Royen 4674*, Merauke, E. bank of Merau R., south of Senajo; *Versteeg 1040*, Noord R.; *Zippelius s.n.*, type of *K. flavida*. — Southeast: Western Dist.: *d'Albertis s.n.*, Fly R.; *Brass 8135*, Lower Fly R., Sturt I.; *NGF 10416*, Oriomo R.; *NGF 35285*, Fly R., 8° 0' S 141° 50' E. — Northeast: Madang Dist.: *Lauterbach 2180*, Oertzen Gebirge (= Mt. Herbert), Nowulja R., type of *Kentrochrosia monocarpa*; *Schlechter 14166*, between the Ramu R. and the coast. — New Britain: *NGF 21792*, Fullerborn Harbour, 6° 6' S 150° 40' E.

SOLOMON IS.

9. *Kopsia macrophylla* Hook. f., *Fl. Br. Ind.* 3 (1882) 639; Ridl., *J. Str. Br. R. As. Soc.* 33 (1900) 110; K. & G., *Mat. Fl. Mal. Pen.* (1907) 434; Ridl., *Fl. Mal. Pen.* 2 (1923) 338; Henderson, *J. Mal. Br. R. As. Soc.* 17 (1939) 56; Timmerman-van der Sleen, *Found. Fl. Males. Misc. Rec.* 1 (1959) 7, f. 1g. — *K. ridleyana* K. & G., *Mat. Fl. Mal. Pen.* (1907) 433; Ridl., *Fl. Mal. Pen.* 2 (1923) 338. — **Fig. 1 g.**

MALAY PENINSULA. Perak: *King 4963*. — Kelantan: *Henderson SF 19496*, Gua Panjang at Gua Minik. — Trengganu: *SF 33892*, Ulu Brang. — Pahang: *Burkill & Haniff SF 16904*, Dong near Raub; *Henderson SF 25044*, Bt. Sedanen. — Negri Sembilan: *Fed. Mal. St. Mus.* 13039, Johol; *Ridley 10093*, Bt. Ontus, Perhentian; *Thapier s.n.*, Bt. Tanga Seremban, 10-2-1903. — Johore: *Ernst 1074*, between Perhentian Tinggi and G. Angsi. — Singapore: *Lobb s.n.*, type of *K. macrophylla*.

10. *Kopsia larutensis* K. & G., *Mat. Fl. Mal. Pen.* (1907) 432; Ridl., *Fl. Mal. Pen.* 2 (1923) 337; Timmerman-van der Sleen, *Found. Fl. Males. Misc. Rec.* 1 (1959) 13.

MALAY PENINSULA. Peninsular Thailand: *Kerr 18378*, Puket, Tap-put. — Kedah: *Nagaswamy 19*, Kulim, Sungai Ular. — Perak: 10 collections, incl. *Wray 2736*, Sungei Larut, type.

11. *Kopsia lapidilecta* Timmerman-van der Sleen, [*Found. Fl. Males. Misc. Rec.* 1 (1959) 13, *nom. inval.*] *Blumea* 10 (1960) 137, f. 1.

MALAY PENINSULA. Johore: *Burkill 4230*, off 32nd mile Johore Bahru-Mersing Rd., near Sg. Mupar.

BORNEO. Sarawak: *Haviland 3042*, Rejang, Kapit, Kalong, ~1893. — Anambas Is.: *Henderson 20395*, N. Temaja, G. Datoh. — Natuna Is.: *van Steenis 1384*, 1385 (type), Bunguran, east slope G. Ranai.

Note. The type has smaller leaves (max. 15 × 7 cm) than the others. On behalf of

their long and stout older cincinni, these latter have been compared by some authors with *K. dasyrachis*. Contrary to this species, all specimens of *K. lapidilecta* have in common the short joints of the cincinni, the peculiar colour of the corolla, the high widening of the corolla tube, and the glabrous ovary. *K. dasyrachis* has long joints, white, moreover considerably larger corollas with a tube widened 7 mm below the throat, and a pilose ovary.

12. *Kopsia dasyrachis* Ridl., Kew Bull. (1934) 123; Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 8. — Fig. 1 d, k; 2 c.

BORNEO. Sabah: 33 collections.

13. *Kopsia tenuis* Leenh. & van Steenis [in Timmerman-van der Sleesen, Found. Fl. Males. Misc. Rec. 1 (1959) 11, *nom. inval.*] Blumea 10 (1960) 13, f. 2.

BORNEO. Sarawak: 6 collections, incl. Ridley s.n., Mattang, type.

Note. In this species the difference between adult and young inflorescences alluded to in the introduction is more pronounced than in all others: the young inflorescence is erect and its joints are short, e.g. 2 mm in *Purseglove* 4819 and *Paie* S 13625. All other characters of these plants are in good agreement, however; leaves, nerves, the acute bracts and orbicular calyx lobes, and the corolla.

14. *Kopsia profunda* Markgr., *nov. sp.*

Frutex vel arbuscula. *Folia* chartacea, ovata, basi cuneata, apice caudata, in dorso caudae glandulifera, 7—17 × 2,5—5,5 cm; nervi laterales ad 10 paria, 6—12 mm distantes, arcuati, rete tertiarium lacunis elongatis conspicuum. Petiolus 3—5 mm longus. *Inflorescentia* tenera (1 mm diam.), cymosa, semel vel bis dichasialis, ramuli cincinnati, articuli bracteis longiores; pedunculus communis 1—2,5(—5) cm longus, pedunculi ramulorum 0,5—1 cm longi. Bractee triangulares, 1 × 0,8 mm. *Calycis* lobi ovati, acuminati, 1,2—1,4 × 0,7 mm, ciliati, apice extus glandula ornati. *Corolla* alba, in fauce lutea, tubus 20—25 mm longus, 1 mm diam., ampliatus et staminifer 13 mm infra faucem constrictum, modice pilosum, lobi corollae 20—25 × 6—8 mm. *Antherae* 2 mm longae, filamenta 0,6 mm longa. *Ovarium* 0,7 mm altum, apice pilis longis albis indutum. *Squamae disci* eo aequilongae vel longiores. *Caput stigmatis* cylindricum, rugulosum, breviter apiculatum, basi collo pendulo cinctum, 1,3 mm longum, antheras attingens. *Stylus* brevis, 8 mm longus.

MALAY PENINSULA. SF 33892, Ulu Brang. — T r e n g g a n u: Corner SF 25936, Kemaman, Bt. Kajang; Sinclair SF 39917, 23d mile Trengganu-Besut Rd., proposed Belara F. R., type (L. holo).

Note. Remarkable by the very deep insertion of the stamens. This, together with the slender inflorescences, the long-haired ovary, and the thin, small, narrow leaves suggest a relationship with *K. mitrephora*. The latter differs by a staminal insertion 4—5 mm below the corolla throat, by joints of inflorescence shorter than the bracts, by less acuminate calyx lobes, and by much smaller corollas. The other species with deep insertion of the stamens (10 mm below the throat), *K. macrophylla*, has stout inflorescences, much larger leaves with the nerves prominent below, and a short-haired ovary. It does not belong here.

15. *Kopsia mitrephora* Timmerman-van der Sleesen, [Found. Fl. Males. Misc. Rec. 1 (1959) 7, *nom. inval.*] Blumea 10 (1960) 136. — Fig. 1 h.

BORNEO. B r u n e i: BRUN 3101, Belah Priok Puteh, Bt. Peradayan. — S a b a h: SAN 16118, Dist. Lahad Datu, Sungei Sabahan to Sungei Dok, type (L holo); SAN 20523, Gumantong.

16. *Kopsia lancifolia* Markgr., nov. sp.

Arbuscula ramulis quadrangularibus, anguste alatis instructa. *Folia* sessilia, chartacea, anguste lanceolata, basi cuneata, decurrentia, apice caudata, cauda infra glandula apicali ornata, lamina 6—8 × 1—1,5 cm; nervi laterales 10—12 paria, recti, 2—4 mm distantes, nervus marginalis 0,5 mm intra marginem. *Inflorescentia* cymosa, semel furcata (raro bis), pedunculus communis 5 mm longus, ramuli cincinnati, sessiles, articuli bracteis breviores. Bractee ovato-acuminatae, 1,2 × 0,6 mm. *Calycis* lobi ovati, 1,5—1,8 × 1,0 mm, ciliati, apice extus glandula ornati. *Corolla* alba, tubus 25 mm longus, intus pilosus a fauce usque ad 10 mm, ampliatus et staminifer 3 mm infra faucem constrictum, pilosum, lobi 12 × 4 mm (in alabastro). *Antherae* 2 mm longae, filamenta 0,6 mm longa. *Ovarium* 0,7 mm altum, setulis rigidulis, fuscis, brevibus indutum. *Squamae disci* breves. *Caput stigmatis* cylindricum, 1,2 mm longum, apice obtuse et breviter apiculatum, basi collo pendulo cinctum, antherarum basin attingens. *Stylus* 15 mm longus.

BORNEO. S a b a h: Nooteboom 1089, Mendulong, 4° 56' N 115° 37' E, type (L holo).

N o t e. This species may be related to *K. mitrephora*, but that has terete twigs, at the most bi-angular when young, not four-winged, much broader elliptic leaves, and its corolla tube has the widened part 4—5 mm below the throat.